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but owing to their inaccessibility it was not deemed advisable to establish stations on them during 1895.

The rivers of North Carolina flowing eastward and above the fall line have many large undeveloped water-power privileges. The Yadkin River at the Narrows, about 35 miles below Salisbury, is perhaps the finest water power in the State. The river just above the canyon is 1,000 feet wide, but as it enters the gorge it suddenly contracts to a width of 75 feet, and in some places even to 30 feet. In two miles the river falls 60 feet and in four miles about 110 feet. The nearest accessible point to the Narrows where a gauging station would be established was at the Southern Railroad crossing near Salisbury. The discharge as measured here last September was 1,450 second feet or a discharge of 0.43 cubic feet per second per square mile of area drained. The past season has been one of extreme low water, and this result is large compared to the run-off of more northern rivers. In fact, all of these sand-hill streams of the Southern States have a large low-water flow. The sandy soils of their basins acting as sponges absorb the spring rains and let the water off gradually in the summer time. A station was established in 1895 on the basin of the Catawba at Fort Mill, South Carolina, also one on the Cape Fear at Fayetteville, North Carolina, and two at Clarksville, Virginia, one on the Dan and the other on the Staunton.

A partial inspection of Georgia has been made and two stations established in the State on the two most important rivers, the Chattahoochee and the Ocmulgee. The former stream is peculiar in having a very high summer flow. The gauging on October 15, 1895, near Atlanta gave a discharge of 0.69 cubic feet per second per square mile of area drained. A comparison of this run-off with the minimum flow of some other rivers is as follows:

	Drainage Area in Square Miles.	Second Feet per Square Mile.
Sudbury, Mass.,.....	78	0.04
Pequannock, N. J.,.....	63	0.13
Ramapo, N. J.,	160	0.14
Paulinskill, N. J.,.....	126	0.13
Neshaming,.....	139	0.01
Merrimac, Mass.,	4,600	0.31
Connecticut, Conn.,	10,234	0.31
Potomac, Va.,.....	9,654	0.12
Shenandoah, Va.,.....	2,995	0.30
Yadkin, N. C.,.....	3,399	0.43
Catawba, S. C.,	2,987	0.45
Ocmulgee, Ga.,	2,250	0.34
Oconee, Ga.,	2,973	0.36
Chattahoochee, Ga.,	1,600	0.69

CYRUS C. BABB.

AN ASTRONOMICAL CIPHER CODE.

IN the last number of the publications of the Astronomical Society of the Pacific, Prof. Holden prints a suggested improvement upon the Science Observer Cipher Code, devised by Messrs. Ritchie and Chandler, that has been in use by astronomers for the transmission of telegraphic announcement of astronomical discoveries during the past twelve years.

It will be remembered that this very important matter of prompt transmission of astronomical intelligence was effected through the Smithsonian Institution from 1873 to 1883, and in the latter year arrangements were concluded by which the service was transferred to the observatory of Harvard College, the observatory thus becoming the central station for astronomical announcements in this country. A most useful code for the accurate and economical transmission of telegrams had been devised by Ritchie and Chandler, and was subsequently improved upon from time to time, and finally issued in 1888 in the shape of the Science Observer Code Book, a quarto of some 235 pages. The bulk of this is taken up by a number code covering two hundred pages and containing forty thousand words in all. The principle

adopted is that each word shall differ by at least two letters from every other word in the code, and no word of more than ten letters shall be included. The words are taken from all languages, many of them from the Spanish, and the difficulty that seems to have suggested to Prof. Holden the desirability of a change has come from the common use of the telephone in the transmission of telegraphic messages to the observatory.

The words of the despatch have to be spelled out over the telephone, and in many cases the code words are entirely meaningless to the ordinary operator. Prof. Holden suggests a condensation of the code by which the forty thousand words, occupying two hundred pages, may be covered by two octavo pages, the first consisting of five hundred prefixes, and the second of ninety-nine affixes; the prefixes each of three letters, and the ninety-nine affixes each of five letters; so that by these two tables any number of five figures less than fifty thousand can be made up of a cipher word always of eight letters. It produces, of course, pure jargon, but this is no worse than most of the words in the old code.

The idea of control words to insure the accuracy of the telegraphic transmission of important data, due to Ritchie and Chandler, is, of course, retained in the suggested modification of the code published by Prof. Holden, as well as the list of phrases of the original code.

Prof. Holden publishes as an appendix to his code the circular of the Central Bureau of astronomical telegrams of Europe, from Prof. Kreutz, of the Kiel Observatory, which has not apparently been published hitherto in America.

CURRENT NOTES ON PHYSIOGRAPHY.

ICE WORK, PAST AND PRESENT.

PROF. T. G. BONNEY, of the University College, London, contributes a work of the

above title to the International Scientific Series (Appleton, 1896). Its three parts discuss existing evidence of ice work from Alpine, Arctic and Antarctic glaciers, traces of the glacial epoch, and theoretical questions. The two first parts are not clearly separated, for the ancient moraines of Switzerland are described under both. Although containing much interesting material, the work is rather disappointing in its deficiency of thoroughly scientific quality. No one could learn from the associated accounts on the Deckenschotter of the Uetliberg and the Zurich moraine that an enormous erosion interval separated the formation of the two deposits, and that the former is only a remnant of a widespread sheet of drift. After the habit of the English school, the geological structure of till is largely dwelt upon, with too brief explanation of its geographical effects. A disproportionate amount of space is given to the Parallel Roads of Glen Roy; and too much authenticity is allowed to Lake Ohio by the reproduction of Clapp's hypothetical map, without reference to the very grave doubts that have been expressed as to its verity. Some once-controverted but now-settled questions are treated in a still doubting manner that hardly represents the present status of glacial geology.

DISSECTED BASALT PLATEAUS OF NORTH-WESTERN EUROPE.

SIR A. GEIKIE, for many years a student of the ancient volcanic rocks of Scotland and neighboring countries, now presents an outline of his results. (*Quart. Journ. Geol. Soc.*, LII., 1896, 331-405.) These are largely concerned with structural features—the lava flows, the vents, the sills and dikes, the gabbro and granophyre intrusions—but they also include matters of physiographic interest—the rivers of the volcanic period, the effects of denudation, and particularly the parallel drawn with modern volcanic